

ENVIRONMENTAL MEASUREMENTS LABORATORY

Annual Report—FY2004

FEBRUARY 2005



Homeland
Security



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ENVIRONMENTAL MEASUREMENTS LABORATORY

ANNUAL REPORT

FY2004

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DIRECTOR'S MESSAGE

I am pleased to present this overview of EML's FY 2004 accomplishments. We performed a number of challenging projects and met major milestones. EML's excellence is achieved by setting high standards of performance for its staff, maintaining priorities, and focusing on its mission. As a member of the Homeland Security community, we applied our expertise in radiation and radioactivity science to improve the science and technology available to our nation's responders and to develop and implement standards for technologies. We continue to build strong partnerships with the New York regional response community and other components of our nation's homeland security network. Through these partnerships, we have been able to facilitate the rapid transition of these new technologies to federal, state, and local operational end users. We have also been able to work with these users to build their response capabilities, capacity, and operations through technology, training, and planning. To meet the challenges of homeland security, America needs the technological advantages that EML and others in the science and technology community provide. Our diligence and sustained efforts continue to contribute to our national effort to anticipate, prevent, respond to, and recover from terrorist attacks, and to ensure that our borders are safe and secure. I welcome the opportunity to demonstrate how the Laboratory, together with our sponsors and partners, successfully met its mission and supported the missions of the Department of Homeland Security and the Office of Research and Development within the Science and Technology Directorate.

A handwritten signature in black ink that reads "Mitchell D. Erickson". The signature is written in a cursive, flowing style.

Mitchell D. Erickson
Director, Environmental Measurements Laboratory

EML FY 2004 ANNUAL REPORT TABLE OF CONTENTS

EML's ROLES	1
TEST AND EVALUATION OF TECHNOLOGY SYSTEMS FOR RADIOLOGICAL AND NUCLEAR COUNTERMEASURES	2
TECHNICAL ASSISTANCE: LOCAL OUTREACH, INTERAGENCY, DHS	12
HIGH EXPLOSIVES COUNTERMEASURES	20
DEVELOPMENT AND IMPLEMENTATION OF STANDARDS	21
OTHER ACTIVITIES	27
EML PUBLICATIONS	35

EML'S ROLES

EML's programs have been framed to focus on and fulfill its mission statement: The Environmental Measurements Laboratory advances and applies the science and technology required for preventing, protecting against, and responding to radiological and nuclear events in the service of Homeland and National Security.

To fulfill its mission and support the missions of the Department of Homeland Security (DHS) and the Office of Research and Development (ORD) within the Science and Technology Directorate (S&T), EML's roles include:

- *As an S&T field unit*, serve as a direct link from DHS to the local operational-level organizations to convey information and receive feedback on operational experiences and serve as ORD's direct agent for transitioning technology to operational environments in a high target area (New York City)
- *As technical specialists*, provide an interface between the scientific R&D community and the user community to communicate and foster the adoption of DHS standards by operational elements in New York City and to deploy, adapt, and refine technologies and develop protocols for their use
- *As researchers*, lead and participate in fundamental studies to provide the benchmark data needed for sensor and standards development and improvement
- *As agency representatives*, work with standard development organizations, other government agencies, and national organizations to provide technical assistance and participate in workgroups that address issues that impact detection for interdiction and incident management and recovery

TEST AND EVALUATION OF TECHNOLOGY SYSTEMS FOR RADIOLOGICAL AND NUCLEAR COUNTERMEASURES

The Department of Homeland Security is committed to using cutting edge technologies and scientific expertise to meet its goal to make America safer. DHS/S&T is tasked with researching and organizing the scientific, engineering, and technological resources of the United States and leveraging them into technological tools to help protect the homeland. The overall goal is to establish operational prototypes and to transfer, as rapidly as feasible, state-of-the-art radiation detection technology to the New York City end user community.

EML is applying its unique working relationships with local end users to transition radiation equipment and sensor systems from the developing and testing phases to operational field trials. Components are selected from those being developed by national laboratories and commercial developers. As technical specialists, EML provides an interface between the scientific R&D community and the user community for deploying, adapting, and refining technologies and developing protocols for their use.

DHS Science and Technology Countermeasures Test Bed (CMTB) New York Project Office (NYPO)

Facilities at the Port Authority of New York and New Jersey (PANYNJ) are used as test beds for technologies designed to detect weapons of mass destruction at critical elements of an intermodal transportation system. These technologies include commercial-off-the-shelf (COTS) radiation detection equipment as well as advanced sensor systems and prototypes being developed by DOE's national laboratories. Field trials play a key role in providing a link between the state and local users of technology and the developers of that technology and in establishing a transferable technology for countering and addressing the radiological/nuclear threat across the entire nation. The NYPO is located at EML and was established to lead the implementation of the project, as well as to coordinate, manage, and facilitate the CMTB field activities and project information and data. This project includes a predeployment testing phase at Brookhaven National Laboratory's (BNL's) Radiation Detector Testing and Evaluation Center (RADTEC) using a variety of radiation sources under a variety of operational conditions. BNL's RADTEC will produce

normalized baseline data that can be used to compare the performance of the radiation detection system prior to the deployment at PANYNJ locations.

(Adam Hutter)



Demonstration at BNL's RADTEC

Field Observations, Assessment, and Data Collection

The CMTB has established a Systems Analysis Working Group (SAWG) to evaluate all operational information from the deployment of systems at the PANYNJ facilities to determine the efficacy of inspection measurements and techniques and to

evaluate the overall cost of deployment and operation, including impact on society. As such, the SAWG determines the data necessary to answer these questions. Due to the importance of impact data (e.g., affect on traffic, manpower, and human factors), in FY 2004, EML scientists began field observations to evaluate and assess the role and performance of countermeasures technologies and to collect qualitative data at PANYNJ venues. At tunnels and bridges, EML scientists train PANYNJ police to use and respond to operational radiation detection systems. At seaports and airports, EML staff work with Customs and Border



Scientists in the field

Protection (CBP)

inspectors on commercial and advanced systems that are installed and operational. EML staff interact with these end users to receive feedback, observe protocols and procedures, and collect quantitative and qualitative data (e.g., traffic delay) on the use and response of detectors being tested and evaluated at each of the operational facilities.

In FY 2005, the NYPO of the CMTB will be collaborating with the PANYNJ to develop a wireless metropolitan area network to support CMTB radiation detection sensors deployed at various Port Authority facilities. The connection into the PANYNJ wireless network will be located at EML, providing a direct link to the sensors and enabling remote access to the sensor data.

(Adam Hutter, Anna Berne, Alfred Cavallo, Karin Decker, Ada Kong, Matthew Monetti, Fabien Raccah, Peter Shebell)

Training

As part of the CMTB, the NYPO sponsored five PANYNJ police personnel to attend specialized radiological/nuclear training at Los Alamos National Laboratory (LANL). The course, “Training the Trainers,” included classroom lectures and practical training to identify and search for special nuclear material.

EML assisted Sandia National Laboratories with preparing and conducting the training provided to DHS/CBP inspectors, Port Authority Police, and seaport terminal operators who will be using the radiation detection equipment at the maritime venue sites. Training included classroom lectures on the basics of radiation, radioactivity measurements, and familiarity of specific technologies, as well as practical training on the equipment deployed in the field.

(Adam Hutter, Matthew Monetti, Fabien Raccah)

Technology/System Demonstrations to End Users and VIPs

Demonstrations of CMTB technologies and tours of CMTB installation sites were often requested by end users, politicians, and other key decision makers. As the DHS national test bed, the CMTB offers a unique opportunity for representatives with WMD (*Weapons of Mass Destruction*) detection concerns to better understand detection and interdiction technology issues at operational transportation facilities.

Demonstrations of significance were:

- Briefings and demonstrations were given to staff members from the U.S. Senate Appropriations Committee on Homeland Security, to Rep. Frank A. LoBiondo (R-NJ), and to Senator Charles E. Schumer (D-NY) at Howland Hook Marine Terminal (*name changed to New York Container Terminal*) on Staten Island, NY, of installed radiation detection equipment and the procedures used by the DHS/CBP for inspecting cargo for radioactive materials at U.S. points of entry and for discriminating radiation signatures from threat, industrial, and naturally-occurring radioactive material.
- Sean O'Shea, Transportation Aide to Sen. Hillary Clinton (D-NY), visited the PANYNJ to better understand economic development and port security efforts. Using National Institute of Standards and Technology (NIST) radiation sources, EML and CBP demonstrated the SMARTCart, an improved secondary inspection technology for radionuclide identification developed by Sandia National Laboratories.
- Representatives from the Hawaii Department of Transportation toured seaport facilities in the New York City area to gain experience and lessons learned as they move forward with radiation detection equipment deployments.
- EML participated in the planning and demonstration of radiation equipment and communications networking that are in place at Howland Hook Container Terminal (*name changed to New York Container Terminal*) for the U.S. Department of Defense/Joint Warrior Interoperability Demonstration, which is being operated by the U.S. Northern Command. Approximately 40 attendees from various federal, state, and local agencies were present for the demonstration that included remote data and information transfer and a video downlink from a helicopter of the operations following a radiation detection alarm from known radiation sources placed inside a cargo container.

(Adam Hutter)

Enhanced Operations

In addition to the role of testing and evaluating technologies and their use at transportation facilities, the CMTB has an additional mission to augment operational efforts during periods of heightened security alerts and National Special Security Events. During these operations, EML has performed the lead role for deploying scientists and equipment to vital nodes of the New York City transportation network. In FY 2004, augmented operational support was deployed for New Year's Eve and the Republican National Convention.

(Adam Hutter, Paul Goldhagen, Matthew Monetti, Peter Shebell)



Transportable Radiation Monitoring System (side view) during New Year's Eve deployment

Radiological Pilot Program Office (RPPO)

EML supports the S&T role for the RPPO, which is led by DHS/Border and Transportation Security (BTS). The RPPO leads the planning effort for a regional defense in-depth radiological interdiction program with New York City area agencies. The RPPO has an Executive Steering Committee comprised of representatives from BTS, Office for Domestic Preparedness (ODP), and S&T. Thirty million dollars (\$30M) of ODP funds are allocated to the RPPO, including efforts in New York City (\$25M) and Charleston, SC (\$5M). A Regional Steering Committee guides the New York City efforts and includes representatives from the grantee agencies: New Jersey Office of the Attorney General, New Jersey Office of Counter-Terrorism, New York Office of Public Safety; Port Authority of New York and New Jersey, Metropolitan Transportation Authority, and the New York City Office of Emergency Management. EML will provide guidance on technology selection for the regional agencies to develop Concept of Operations and Response Protocols from lessons learned in the Countermeasures Test Bed.

(Adam Hutter; Raymond Lagomarsino)

New York City Test Bed for Search and Characterization Equipment

Incident Management Radiological Monitoring Network

The New York City Office of Emergency Management (NYC OEM) is a key participant in the DHS NY/NJ Radiological Defense System grant (*see above on Radiological Pilot Program Office*), a regional effort focused on deploying systems to protect against radiological/nuclear terrorism. In FY 2004, activities focused on working with the NYC OEM to better understand its radiation detection needs and apply EML expertise to develop a system that will be useful to local first responders for radiological detection and incident management. With the assistance of NYC OEM's GIS (*Geographic Information System*) Department, five initial sites have been selected for deploying the EML-developed Comprehensive Radiation Sensor (CRS) gamma-spectrometers. The sites, all located in Manhattan south of 59th street, are in high-profile areas. Sensors will be located outdoors on building rooftops or setbacks, typically 3 to 15 stories above ground level. EML expects to deploy an expanded radiation detection system that comprises up to 30 CRS units by October 2005. Site selection will also be coordinated with the NYC-Urban Dispersion Program and will be co-located where feasible.

Building upon the success of a prototype EML-developed CRS, a second-generation CRS that uses improved electronics appropriate for outdoor, 24/7 operation, was designed, built, tested, and deployed in February 2003 on the roof of EML's building in lower Manhattan. EML will deploy generation II CRS units at future monitoring network sites.

EML is developing improved software, will install and maintain the CRS units, and will provide training to network users. A wireless data communications system will be used to transmit data from the radiation detectors to information centers located at EML, NYC OEM, and other locations. A commercial vendor will provide the communications system, which employs multiple technologies: GSM cellular, geosynchronous satellite, and secure Internet for high reliability even under emergency conditions.



Interior of CRS II cabinet showing 3-in. x 3-in. NaI scintillator, photomultiplier tube, and Ortec DigiBASE multi-channel analyzer (left), embedded computer (center), and Canberra Mini-Radiac (upper right)

Maritime Interceptor for Nuclear Detection (MIND)

In conjunction with the S&T Countermeasures Test Bed, EML is installing a CRS system on the Maritime Interceptor for Nuclear Detection (MIND) to provide gamma radiation sensing capability. This boat will aid local law enforcement in detecting the presence of radioactive materials on maritime vessels of a size generally less than 50 ft. long and 30 ft beam. The boat operators will be able to pull alongside other vessels in marinas or open water around the New York/New Jersey metropolitan area and detect changes in radiation level that could indicate the presence of a radiation source.

In FY 2004, EML fabricated and provided three ruggedized vibration mounted detectors, computer hardware, and customized software geared toward use by local law enforcement. Software was written that combines data from the three detectors, performs calibration and detector malfunction checks, triggers alarms at elevated radiation levels, and displays gross gamma count and spectral information. The detectors and associated electronics were installed on the MIND, and the vessel was transported to a New Jersey State Police facility.

In FY 2005, isotope identification capability will be added to the system, and EML will assist in system testing, operator training, and developing protocols for sensor calibration and data management.

(Lawrence Ruth, Norman Chiu, Brian Albert, Cecilia Breheny, Camille Marinetti, Saby Tavales, Ethel Jacob, Paul Bailey)



One of two CRSs mounted in the rear of the boat. A third CRS is mounted in the bow.

New York City Urban Dispersion Program (NYC-UDP)

EML is a principal partner in the NYC-UDP, which is composed of a multi-agency team involving DOE National Laboratories (BNL, PNNL, LLNL, LANL, LBNL), the Defense Threat Reduction Agency, NOAA, U.S. EPA, and academic institutions. The primary objectives of the program are to enhance the emergency preparedness of the New York City Office of Emergency Management (NYC OEM) in responding to potential airborne releases of harmful materials, and to evaluate and improve indoor and outdoor urban atmospheric dispersion modeling. UDP will enhance the meteorological and radiological monitoring capability in and around New York City and will conduct field tracer studies to test and improve urban dispersion models by comparing model results with tracer field data. This will provide emergency managers and first responders with more accurate information regarding the spatial extent and timing of the dispersion of hazardous agents, such as chemical, biological, and nuclear materials.

EML hosted the scientific “kick-off” meeting in June 2004, at which work plans were developed to establish meteorological and radiological monitoring networks in New York City.

Subsequently, EML visited the National Oceanic and Atmospheric Administration at Oak Ridge, TN, and the National Climatic Data Center in Asheville, NC, to meet with other team members to discuss the coordination of the deployment of networks.

In September 2004, NYC OEM hosted a local “kick-off” meeting to introduce the NYC-UDP to New York City agencies. Invited representatives included NYC OEM; NYPD (*New York City Police Department*), FDNY (*New York City Fire Department*), New York City Department of Environmental Protection, New York City Department of Health and Mental Hygiene, and City Hall.

Related to urban air flow modeling research, EML attended the 8th Annual George Mason University Conference on Transport and Dispersion Modeling, a conference that attracted the attention of many internationally and nationally prominent scientists in the field of



Scientific “kick-off” meeting at EML June 2004

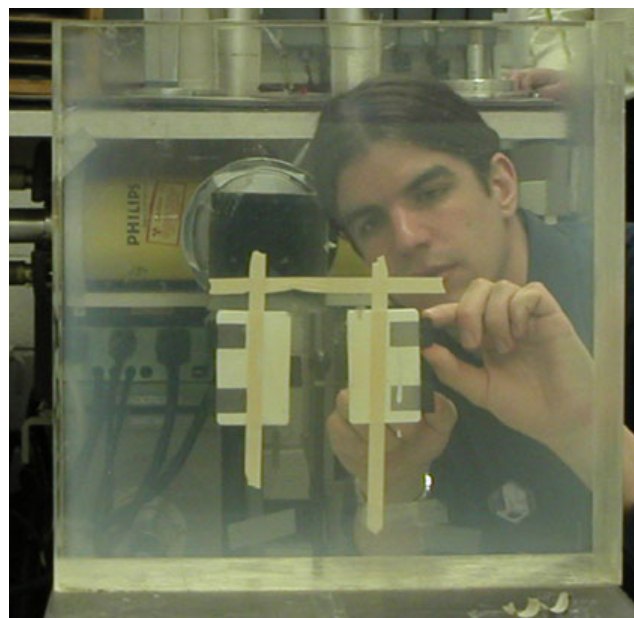
atmospheric transport and dispersion; the Urban Dispersion Modeling Working Group Meeting sponsored by the Defense Threat Reduction Agency at the NASA Goddard Institute for Space Studies in New York City; and an urban Meteorology Forum for Users and Providers sponsored by the Office of the Federal Coordinator for Meteorology, which was held in Rockville, Maryland.

(*Sam Lee*)

Citizen’s Dosimeter

In FY 2004, EML initiated research into the feasibility of the development of the Citizen’s Dosimeter, a personal radiation credit card format dosimeter that could measure doses in the range of about 20 mrem to 1,000 rem. The dosimeter, used with strategically placed card readers, is designed to be worn by individuals to measure external gamma dose in the aftermath of a radiological terrorist event. As individuals move through a city with areas of varying radiation exposure, the dose received would depend on the paths taken and the time spent at the location. A personal integrating dosimeter would allow tracking of the accumulated dose and would verify that an individual’s dose received is within acceptable limits and could be used to provide dose of record or to control access. After cleanup, personal dosimetry could boost public confidence that their external dose is below acceptable maximums and that the final cleanup was effective. Public knowledge would minimize the economic and social disruption to the affected area.

A partnership with industry was initiated to adapt existing technology in a new dosimeter configuration that would be similar to using an ATM or a subway fare card. EML visited laboratories



Experiments at Landauer

involved in research and development of optically stimulated luminescence materials and techniques at Oklahoma State University and at Landauer Crystal Growth Facility in Stillwater, OK. Landauer, Inc., in Glenwood, IL, is a major provider of radiation dosimetry services, with 1.4 million people being monitored worldwide. The company collaborated with EML in testing its Luxel radiation sensitive material for use in the Citizen's Dosimeter. StorCard, Inc., in San Jose, CA, provided samples of a media storage device under development that could be adapted to provide the dosimeter housing and shutter mechanism.

In FY 2004, the elements of a prototype dosimeter were modeled and tested. The dosimeter elements include metal filters for shaping the photon energy response, PVC for card format, and a mechanical shutter for readout control. The research resulted in finding a novel, thin compensating filter consistent with a credit card format.

EML gave an invited talk at the 14th International Conference on Solid State Dosimetry held at Yale University in New Haven, CT. The paper, "External Dosimetry in the Aftermath of a Radiological Terrorist Event," was presented in the plenary session, "Counter-Terrorism."

In FY 2005, a prototype dosimeter that maximizes the use of existing technology will be constructed and tested for radiation response. Its performance will be specified to meet the personnel dosimetry standard ANSI N13.11, "Personnel Dosimeter Performance - Criteria for Testing."

(Gladys Klemic, Paul Bailey)

Communications

Data Transmission

One of the issues surrounding the deployment of fixed radiation sensors in field situations involves data communications and the need for data retrieval. Data from an instrument must often be transmitted to a near-range central node or computer, then sent to a central repository, database, laboratory, or command center by long-range solution such as secure Internet, satellite, or cellular communications. In FY 2004, EML investigated various resources with promising short-range wireless solutions for radiation sensors. EML documented available test results and experiences from other sources in preparation for selecting wireless technologies for various radiation instruments.

EML initiated discussions with Stevens Institute of Technology in Hoboken, NJ, on potential areas of collaboration. Their Wireless Network Security Center (WiNSEC) is a leading technological center dedicated to solving technical and organizational problems related to design and operation of secure communications platforms for military and homeland defense. In April 2004, Paul Kolodzy, Director of WiNSEC, visited EML and gave a seminar titled "Heterogeneous Mobile Networking." In FY 2005, a follow-up visit to Stevens is planned to explore areas of collaboration on secure wireless data transmission technologies relevant to EML's need to transmit data from radiation sensors in the field to information and command centers, as well as to explore cellular, wireless IP (*Internet Protocol*), and visualization architecture.

Integrated Data Management

In FY 2004, work was initiated on the development of the design basis for an Information Management Facility (IMF), which will provide an integrated approach to access, process, display and store information, including real-time radiological and meteorological data from field-located instrumentation. The data will be generated in several key radiological/nuclear countermeasures projects, including the Countermeasures Test Bed, the New York City Urban Dispersion Program, and the Incident Management Radiological Monitoring Network. The IMF will have the capability to display data and computer simulations in various



Example of the GIS interface system

formats, including tabular, graphical, and visual. It will provide EML, its customers (e.g., the NYC OEM), and other authorized users a central facility and work station with the tools needed for the timely interpretation of field measurements.

EML and ESRI initiated collaboration on the development of an Internet based GIS (*Geographic Information System*) map interface system for communication of

information from EML's radiation sensor network in New York City. In January 2004, EML presented a poster titled "Radiation Event Manager" at the ESRI Federal User Conference held in Washington, DC. The poster illustrated an approach to display and manage a network of stationary radiation sensors using ESRI's ArcIMS software. The target users are local, state, and federal agencies involved in New York City emergency response. This system will use geographic data from the NYC Department of Planning's Bytes of the Big Apple data set combined with real-time measurements from the EML sensor network. Initial discussions have focused on how to make this system available to first responders via PDA or cell phone. (Lawrence Ruth, Cecilia Breheny, Ethel Jacob, Richard Larsen, Camille Marinetti)

Experimental Study of the Neutron "Ship Effect"

To improve the nation's ability to detect and identify nuclear materials and devices that might be hidden on ships, EML is collaborating with the University of Delaware, the Remote Sensing Laboratory, the U.S. Naval Academy, and the U.S. Coast Guard Research and Development Center to measure and understand the neutron "ship effect"—the increase in background neutron count rate generated by the interaction of cosmic-ray particles with the large mass of steel in ships. The "ship effect" can cause nuisance alarms that interfere with detection and identification of hidden nuclear materials.



EML extended-energy multisphere neutron spectrometer set up on a middle deck of the USNS *Mendonca* with cargo

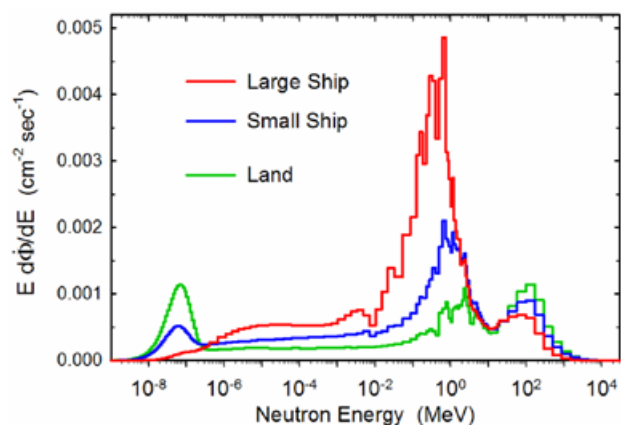
The approach is based on using EML's unique extended-energy multisphere neutron spectrometer (MNS) to measure the full energy distribution (spectrum) and intensity of cosmic-ray neutrons, including the normally undetected high-energy neutrons that cause the "ship effect." The cosmic-ray neutron spectrum is measured on land, on ships, and over water, and measurements are made in the same locations with portable neutron detectors of the types used to search for and identify clandestine nuclear materials. By correlating these two sets of measurements and comparing them with calculated neutron spectra, this study characterizes and quantifies the expected changes in background neutron count rates in various locations affected by the "ship effect." This will reduce the false positives that distract search teams, impede commerce, and cause unnecessary mobilization of expert responders.

The calculated neutron spectra are provided by the University of Delaware based on transport of primary cosmic-ray particles through the magnetic fields of the solar system and the earth, and radiation transport of the primaries and all their reaction products through the atmosphere. These calculations also provide spectra of ground-level cosmic-ray protons and muons, which are needed to determine the fraction of the "ship effect" caused by these particles and to correct the neutron measurements for response to them.

The equipment and methods used for the "ship effect" spectrum measurements were developed earlier for other projects, and some of that work was presented in FY 2004. EML presented "Calculations and Measurements of the Cosmic-Ray Neutron Spectrum on a High-Altitude Airplane" and was coauthor of "Measurements of the Flux and Energy Spectrum of Cosmic-Ray Neutrons on the Ground at Various Locations" at the IEEE Nuclear and Space Radiation Effects Conference in Atlanta, GA.

The collaborations for the ship measurements got underway with two workshops. A multi-agency "1st Mini-Workshop on the Neutron Ship Effect" was held at DOE's Remote Sensing Laboratory (RSL) at Andrews AFB in November 2003, at which EML gave three of the seven technical presentations and during which collaborative neutron measurements were planned. The first workshop was followed by a "Workshop on Terrestrial Neutron Spectroscopy" held at the Johns Hopkins University Applied Physics Laboratory. EML gave a presentation on "Measurements of Cosmic-Ray Neutron Spectra Aboard an Airplane and on the Ground" and planned collaborative measurements with the U.S. Naval Academy.

Measurements with the EML MNS were made on two ships, on land and on a wood pier over water. In January and February 2004, measurements were made on the USNS *Mendonca*, a large Military Sealift Command cargo ship, while the ship was docked and while it sailed to Crete loaded with cargo. Measurements were made on a midlevel deck near the center of the ship and on the weather deck before and after cargo was loaded so that the effects of the amount of steel overhead and of cargo could be measured. While aboard the *Mendonca*, the MNS was operated by RSL personnel, and they also made an extensive series of measurements with their portable radiation search instruments. On its return to the United States, the EML MNS was used for a second series of measurements on a ship, on shore, and on a small wood pier over water in collaboration with



Preliminary results: fission-energy cosmic-ray background neutrons increased a factor of 2 on a small ship and a factor of 4 on a large ship compared to measurements on land

U.S. Naval Academy professors and midshipmen. This ship, the USS *Barry*, a retired destroyer that is the Navy's display ship at the Washington Navy Yard, is much smaller than the *Mendonca*. Preliminary results show that fission-energy cosmic-ray background neutrons increased a factor of 2 on the USS *Barry* and a factor of 4 on the *Mendonca* compared to measurements on land.

As EML continues to study the influence of background radiation on instruments used for interdiction of clandestine nuclear and radiological materials, an EML scientist, who is a recognized expert, has been invited to become a member of two international working groups on neutron measurement standards:

- Joint Task Group 50 of the International Commission on Radiological Protection/International Commission on Radiation Units and Measurements (ICRP/ICRU) on "Reference Doses from Cosmic-Ray Exposure for Aircrew"
- Working Group 21 of the International Organization for Standardization (ISO) on "Dosimetry for Exposures to Cosmic Radiation in Civilian Aircraft"

The EML scientist was invited also to be a member of a writing group on ANSI N42.41, "Neutron Interrogation Systems for Contraband Detection."

(Paul Goldhagen)

TECHNICAL ASSISTANCE: LOCAL OUTREACH, INTERAGENCY, DHS

As part of its mission to provide DHS outreach, EML continues to use its technical expertise to assist federal, state, and local agencies and field operational units as they strive to improve homeland security. As a field unit located in New York City, EML is in a unique position to provide outreach, training, and technical assistance on radiation, radiation monitoring, and radiation protection. This scientific and technical reachback provides a direct link from DHS to the end-users and first-responder organizations.

EML also provides technical assistance and outreach to first responders at the federal and state level as the Science and Technology Directorate's Point-of-Contact on interagency technical working groups addressing issues related to response and recovery.

Local Outreach, Training, and Technical Assistance

New York Area Science and Technology Workgroup (NYAST)

EML founded and hosts quarterly meetings of the New York Area Science and Technology Workgroup. NYAST Workgroup is a consortium of federal, state, and local government organizations that meets to communicate the advances in, and foster the application of, science and technology that will be used for homeland security, thus providing a direct link from DHS to the local operational-level organizations for conveying to law enforcement, emergency management and first responders, hospitals, and the private sector new information on developments in science and technology and receiving feedback on field operational experience.

EML organized and hosted two topical meetings in FY 2004. Radiological Dispersal Devices (RDDs)—including Risk-Based Approach, Critical Issues, and Relative Risk Reduction—was the subject of the topical meeting held in March 2004. Considerable media attention has been focused on potential terrorist threats involving RDDs or so-called “Dirty Bombs.” This meeting provided a sound technical overview of the RDD threat with presentations by expert analysts from the National Security Studies Department and the

Advanced Nuclear Concepts Department of the Sandia National Laboratories.

The June 2004 topical meeting covered the “Status of Department of Homeland Security Standards Projects.” The meeting provided an overview of the National Incident Management System (NIMS) and the DHS Science and Technology Directorate



NYAST panel discussions at topical meeting on “Status of Department of Homeland Security Standards Projects”

Standards Portfolio. Guest speakers included representatives from the Federal Emergency Management Agency (FEMA), the National Institute of Standards and Technology (NIST), and EML.

In early FY 2005, EML will roll out a dedicated, password-protected Web site created for NYAST. Features will enable members to register on line for upcoming meetings, as well as to download reports and presentations from past and current meetings.

(Kevin Miller, Rita Rosen)



Evaluating FDNY bunker gear

Fire Department of New York (FDNY)

EML is evaluating bunker gear for shielding against beta radiation.

Preliminary assessments of the garment's mass per unit area as well as Sr-90 beta source attenuation were made. The approximate shielding factors were reported to FDNY. The FDNY HazMat Special Operations Group plans on acquiring new gear, and EML proposes to evaluate the protective quality of the gear against radiation.

(Fabien Raccah, Matthew Monetti)

New York Police Department (NYPD)

In FY 2004, the NYPD continued to utilize EML as a technical resource. Projects of note include:

- At the invitation of the NYPD, EML attended demonstrations of new technologies developed by the private sector. The Autonomous Pathogen Detection System is capable of performing hourly aerosol collection and a rapid automated analysis for pathogens (bacteria, viruses, and toxins). In development for over five years, this system is expected to become commercially available in 2005. EML provided technical support during a demonstration of a mobile radiation detection system provided by Thermo Electron Corporation, an application that has a potentially significant role in the management of emergency operations. Personnel representing local law enforcement, transit, emergency management, and postal and health organizations attended these demonstrations.

(Matthew Monetti)

- As an observer at a training course on "WMD Radiological/Nuclear Responder Operations" conducted by the Bechtel Nevada Counter-Terrorism Operation Support and the NYPD Emergency Service Unit, EML provided feedback on the course from both a scientific and responder perspective and initiated a technical supportive role for EML with each group for future activities.

(Matthew Monetti)

- In response to an inquiry from the NYPD on concerns relating to their pager-type detectors alarming at ground level, EML provided information on the effects of the solar storms that had occurred in October 2003 on radiation levels. EML was able to continuously check radiation levels with real-time monitoring detectors it maintains in the New York area. Although they were large, the solar storms did not produce

the very high-energy particles that would affect ground-level radiation levels. The information EML provided was also passed along to the New York City Office of Emergency Management and the 2nd WMD Civil Support Team stationed in Scotia, NY.

(Paul Goldhagen, Kevin Miller)

- EML participated in a joint project with the NYPD Counter-Terrorism Division and the Lawrence Berkeley National Laboratory to collect air filter elements from police vehicles and analyze them for radionuclide content. First set of results indicated normal levels of the background radionuclides Pb-210 and Be-7. The NYPD has expressed interest in continuing this program.

(Matthew Monetti, Richard Larsen, Karin Decker)

Amtrak

EML provided consultation to AMTRAK's security office at Penn Station, NY, on the use of pager-size radiation detectors, background variations, interpretation of alarms, secondary response sources, and development of protocols.

(Matthew Monetti)



Gamma-ray spectrometry on an automobile air filter obtained from a NYPD patrol car

New York City Department of Health and Mental Hygiene (NYC DOHMH)

EML continues to provide assistance to NYC DOHMH. In FY 2004, EML:

- provided review and comment on its "Radiological Resource Manual," a living document to be updated annually.
- met with the NYC Health Department Deputy Commissioner to discuss the implementation of various federal assets for radiobioassays and consequence management introduced in a white paper from the Brookhaven National Laboratory and EML.
- participated at a planning meeting hosted by the NYC DOHMH and the Center for Disease Control. Representatives from federal, state, and city agencies attended this meeting called to discuss issues related to responding to radiological emergencies, such as radiation equipment and capabilities, mass population monitoring and decontamination, and availability of radioprotective drugs for first responders and emergency workers.

(Fabien Raccach, Richard Larsen, Raymond Lagomarsino, Matthew Monetti, John Kada)

Hudson Regional Health Commission and University of Medicine and Dentistry of New Jersey (UMDNJ)

At the request of the UMDNJ, EML is collaborating on an initiative to study the response of "pocket pager" radiation detectors to clinical doses of routinely used medical isotopes. EML will provide input to the

interpretation of the results of an experiment to identify the dose rate that is needed to trigger an alarm. A paper, coauthored by EML, titled “Sensitivity of Personal Homeland Security Radiation Detectors to Medical Radionuclides and Implications for Counseling of Nuclear Medicine Patients,” was accepted for presentation at the Radiological Society of North America 90th Annual Meeting to be held in FY 2005.

(Matthew Monetti)

General Services Administration (GSA)

In FY 2004, a dumpster belonging to GSA was rerouted from a waste center back to its point of origin at the building in which EML is a tenant because of an elevated radiation level. Responding to GSA’s request for assistance, EML performed radiation measurements and characterized the various waste items. The source of the elevated radiation was found to be a quantity of ice-melting agent that had a high content of potassium, a small fraction of which occurs as the radioactive isotope K-40. Although not dangerous, the levels of radiation were measurable above background, but typical of naturally-occurring radioactive materials.

(Fabien Raccah)

Greater New York Chapter, Health Physics Society

EML presented an invited talk on “Environmental Monitoring for Radiological Incidents” at the Greater New York Chapter, Health Physics Society, Symposium on “Emergency Response to Radiological Incidents.” The agenda included speakers from Los Alamos National Laboratory, NYPD, Walter Reed Army Medical Center, the NYC Department of Health and Mental Hygiene, and REAC/TS (*Radiation Emergency Assistance Center/Training Site*) at the Oak Ridge Institute for Science and Education.

(Kevin Miller)

Radiological Dispersal Device (RDD) Emergency Response Playbook

The RDD Emergency Response Playbook will provide first responders with an understanding of RDDs, threat anticipation guidance, and tailored emergency response actions and recommended technologies and approaches for responding to radiological events. This project will be a multi-laboratory effort led by Los Alamos National Laboratory (LANL) and will include Sandia National Laboratory (SNL), Brookhaven National Laboratory (BNL), and DHS Environmental Measurements Laboratory (EML). In September 2004, LANL chaired a “kick-off” meeting at EML at which representatives from EML, BNL, and Science and Technology’s Office of Research and Development joined in detailed discussions of the “Playbook.” To support its development, the team will perform a gap analysis to determine needed improvements in RDD source characterization, consequence modeling, and isolation, containment, and decontamination technologies. Workshops and other techniques will be used to summarize key DHS consequence management needs. As a first step, the team will evaluate existing RDD response plans of the relevant New York City responder organizations. Customers, including the Port Authority of New York and New Jersey and the New York City Office of Emergency Management, will play a central role in the development of the “Playbook.”

(Alfred Cavallo, Fabien Raccah, Matthew Monetti)

Radiation Reachback Program

In FY 2005, EML will initiate a pilot project on radiation technical reachback to local law enforcement, a program that provides phone-based technical advice on radiation detection to operational personnel in the

field. This program will provide DHS S&T with information to better understand the dynamic of positioning radiation detection equipment in local venues. Expansion of the program beyond Customs and Border Protection (CBP) jurisdiction is planned with Laboratories and Scientific Services (LSS) assisting EML in establishing a parallel pilot program for regional law enforcement entities in the New York area. At the end of FY 2004, the Director of Scientific Services, Customs and Border Protection, visited EML to provide assistance to move this initiative on a path forward based on experience with the CBP LSS. A seminar was presented to the staff on the “CBP Radiation Detection Program.”

(Carl Gogolak)

Training and Technical Assistance: Federal and State

National Special Security Event

The 2004 Republican National Convention held in New York City was designated a National Special Security Event; it was managed by the U.S. Secret Service, FEMA, and the FBI. In planning for this event, FEMA Region II, the NYC OEM, and the New York State Emergency Management Office formed a committee on consequence management on which EML was invited to serve on a detection and monitoring working group.

EML was assigned as Senior Science and Technology Representative to the Principal Federal Official support cell in New York City during this event.

(Adam Hutter)

Consequence Management Subgroup, Operational Guidelines Task Group

EML participated as technical experts to this task group. The contamination on modeling software RESRAD was added to address the issue of the urban environment after a radiological dispersal device (RDD) or an improved nuclear device (IND). The results of this work will be useful to local and state emergency planners and responders before federal assistance is available. Additional work is underway to integrate this new modeling effort into DOE's

FRMAC's (*Federal Radiological Monitoring and Assessment Center*) rapid, scenario-based, dose modeling capabilities in the urban environment.

(Paul Bailey)

DHS U.S. Coast Guard: Captain of the Port of New York and New Jersey– New York/New Jersey Radiological Monitoring Working Group

EML participates in this working group of municipal, state, and federal organizations with



NY/NJ Radiological Monitoring Working Group

responsibilities or capabilities to measure and assess radioactivity releases to the environment. This group has produced SMART-RAD (*Special Monitoring of Applied Response Technologies*), a document that establishes a system for rapid collection and reporting of real-time, scientifically based information to assist the Unified Command structure with decision making during the initial phase of emergency response before full federal resources arrive.

EML prepared an RDD scenario and participated in a SMART-RAD validation exercise. Modifications to the SMART-RAD protocols will be incorporated into the report based on the lessons learned from this exercise.

(Kevin Miller)

DHS Customs and Border Protection (CBP)

EML participated in a CBP operation to screen containers from a cargo ship that arrived at Port Elizabeth, NJ. EML provided scientific support in the use of an advanced prototype radiation detection system, which was designed and built by Sandia National Laboratory as part of the Science and Technology Countermeasures Test Bed.

(Adam Hutter)

Interagency Workgroups on Radiological Protocols

MARSSIM (*Multi-Agency Radiation Survey and Site Investigation Manual*) and MARLAP (*Multi-Agency Radiological Laboratory Analytical Protocols*) workgroups are developing guidelines and laboratory protocols to be used in field sampling and radiological sample measurements following a radiological release. The post-event cleanup survey methodologies and guidelines being developed will provide a nationally consistent consensus approach to conducting radiation surveys and investigations of buildings, soil, and other real property at sites contaminated with radioactivity. The MARLAP Manual was published in July 2004 (NUREG-1576/EPA 402-B-04-001A). The workgroup is developing the Multi-Agency Radiation Survey and Assessment for Material and Equipment Manual (MARSAME) on survey design and analysis procedures for materials and equipment. EML's Web-based comments database, first used for MARLAP, was modified for internal MARSSIM Workgroup use in developing chapters of MARSAME.

To disseminate MARSSIM and MARLAP information, EML, in cooperation with US EPA, taught a training course at Rutgers University in New Jersey in January 2004; in Las Vegas, NV, in March 2004; and in Atlanta, GA, in July 2004. In September 2004, training was provided at the New York State Department of Labor for government personnel. A short course was also conducted as part of the American Academy of Health Physics Continuing Education Program preceding the Annual Health Physics Society Meeting held in Washington, DC, in July 2004. These courses were attended by radiation safety and response professionals.

EML presented two invited papers at a Nuclear Regulatory Commission (NRC) public workshop in Rockville, MD, to provide the NRC staff and the public with an overview of progress on the development of a new computational tool for use in the evaluation of sites with radiological contamination. Invited papers were also given at a meeting of the NNSA Consequence Management Emergency Sampling and Design Working Group held in Las Vegas, NV, which focused on requirements for consequence managements.

EML organized a special session on MARLAP, held at the Health Physics Society Annual Meeting in Washington, DC, in July 2004.

(Carl Gogolak)

Cleanup Criteria Decision Document (C2D2)

The Cleanup Criteria Decision Document (C2D2) records information from cleanup agreements made by DOE, including pre-cleanup contaminant concentration, background concentration, cleanup criteria, and projected land use. Collaboration with Argonne National Laboratory (ANL) to revise and update the C2D2 Database to include additional contaminants relevant to homeland security from the latest DOE records, as well as those under EPA, NRC, or DoD jurisdiction, continued this fiscal year. In collaboration among EML, ANL, and DOE, a paper was published in *Environment, Science and Technology*, “Establishing Remediation Levels in Response to a Radiological Dispersal Event (or ‘Dirty Bomb’),” the subject of which was cited as a lead news item in the journal *Nature* (“US Unprepared for Dirty-Bomb Attacks—Clear Regulations for Cleaning Up Radioactivity After a Terrorist Strike Urgently Needed”). The paper reviews and examines concerns associated with the existing legal frameworks that could apply to cleanup after a radiological terrorist event and shows how site specific remediation levels developed for non-RDD cleanups could be used to benchmark RDD cleanup levels.

(Gladys Klemic)

Interagency Steering Committee on Multimedia Environmental Models (ISCMEM)

EML has begun working with ISCMEM, a steering committee established among eight federal agencies in 2001 to develop a framework for facilitating cooperation and coordination in research and development of multimedia environmental models, software, and related databases, including development, enhancements, applications, and assessments of multimedia environmental models as they pertain to human and environmental health risk assessment.

EML participated at the 4th Annual Public meeting of ISCMEM held at the NRC in August 2004. EML presented an invited paper on a Bayesian Geostatistical approach to radiation survey design and data analysis developed in cooperation with the University of Tennessee.

At the same meeting, EML presented a proposal for a fifth working group on Urban Atmospheric Dispersion Modeling. The new working group was established with EML as the lead and held its first meeting on Urban Air Transport Modeling and Its Standard at USEPA in Research Triangle Park, NC, in September 2004, to discuss plans for pursuing research activities within ISCMEM organizations and to draft a proposal for identifying participants, research resources, and anticipated products. Among the objectives of this working group are to pursue cooperative activities and initiate interactions on atmospheric transport modeling over urban areas and to establish modeling standard guidelines.

(Carl Gogolak, Sam Lee)

Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP)

These programs identify, develop, and transition environmental technologies that relate directly to defense mission accomplishments. EML will continue to establish and maintain lines of communication and coordinate interaction between the Department of Defense and the Department of Homeland Security.

(Merrill Heit)

Exercises: Planning and Participation

The expertise of the scientists at EML has resulted in invitations to participate as observers at various drills and tabletop exercises during FY 2004.

United Defense 04 Exercise (UD-04)

Continuing the effort that began in FY 2003 with participation in the Main Planning Conference for the interagency UD-04 exercise conducted by the DoD's Northern Command, EML took part in the Final Planning Conference and served as a technical advisor for the nuclear detonation scenario of the exercise at the request of DHS/Office of Weapons of Mass Destruction and Incident Management. EML represented DHS/S&T at FEMA Region VI HQ Denton, TX, during the UD-04 Exercise in February. EML provided radiological/nuclear support to the DHS Principal Federal Official.

(Colin Sanderson)



Command Center—UD-04

Operation United Response

EML participated as an observer in the full-scale exercise “Operation United Response” at Shea Stadium in Queens, NY. This exercise was an interagency drill focused on the initial field and hospital-level response to a terrorist threat.

(Fabien Racciah)



Operation United Response

HIGH EXPLOSIVES COUNTERMEASURES

The High Explosives (HE) Countermeasures Program develops and deploys a road capability to prevent and rapidly mitigate the consequences of high-explosives attack. The Program supports improved explosive detection equipment and procedures for all forms of transportation, as well as fixed facilities.

Truck Bombs

In FY 2004, a project was initiated at EML to address terrorist attacks on the general population by suicide bombers and on critical infrastructure and buildings of strategic or symbolic importance by truck bombs. EML is providing research and development on the feasibility of using commercial-off-the-shelf (COTS) radiation detectors to identify potassium chlorate (KClO_3) explosives used in truck bombs. BNL's Radiation Detector Testing and Evaluation Center (RADTEC) will be used to test detection capabilities using large quantities of safe, surrogate potassium compounds configured in a bomb geometry within a motor vehicle.

Theoretical calculations for an explosive KClO_3 and hydrocarbon mixture in a 55-gallon drum were performed. Test runs of KCl water-softening agent in a car trunk were performed through the Holland Tunnel portal. Results indicate that detectable gross radiation (full-spectrum) levels will be produced given a large portal monitor in proximity. Plans have been established to construct a safe “mock” bomb for use in testing spectroscopy-based detection systems. This “mock” bomb will be constructed with surrogate materials such as KCl and sand to simulate the proper K concentration, density, and photon mass absorption coefficient.

(Kevin Miller, Matthew Monetti)



160 pounds of KCl loaded in vehicle trunk used in radiation portal monitor tests

DEVELOPMENT AND IMPLEMENTATION OF STANDARDS

The Laboratory's efforts in standards is part of the national effort coordinated by the S&T Directorate Office of Standards to develop and coordinate the adoption of national standards and appropriate evaluation methods to meet homeland security mission needs. This, in turn, will provide DHS the ability to provide guidance to local/state/federal homeland security entities regarding purchase, performance, deployment, and use of technologies. Standards are needed to ensure that measurement objectives and system performance are sufficient for the application and that some degree of commonality is present throughout the industry in terms of measurement units and hardware specifications. EML's efforts support two programs, namely, Standards for Radiological/Nuclear Countermeasures and Standards for Emergency Preparedness and Response.

Standards for Radiological/Nuclear Countermeasures

The goal of the Standards for Radiological/Nuclear Countermeasures Program is to develop comprehensive standards for the development, testing, and certification of effective detection, response, remediation, and forensics tools for radiological and nuclear materials.

ANSI Standards Development

On February 27, 2004, DHS, through its Science and Technology Directorate (S&T), adopted and publicly released its first group of ANSI standards for radiation and nuclear detection equipment. These standards will assist manufacturers in product development and responder agencies in procurement decisions, as well as provide performance standards and test methods and minimum characteristics for four classes of radiation detection equipment. EML supported the preparations for the S&T press conference at JFK International Airport at which the new ANSI standards were publicly released. EML and Lawrence Livermore National Laboratory planned and ran a demonstration of a portal monitor using a radiation test source produced by the National Institute of Standards and Technology (NIST). EML staff were actively engaged on the writing groups that developed these comprehensive standards:

- ANSI N42.32: "Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security"
(Paul Bailey)
- ANSI N42.33: "Portable Radiation Detection Instrumentation for Homeland Security"
(Fabien Raccach)
- ANSI N42.34: "Performance Criteria for Hand-Held Instruments for the Detection and Identification of Radionuclides"
(Peter Shebell)
- ANSI N42.35: "Evaluation and Performance of Radiation Detection Portal Monitors for Use in Homeland Security"
(Adam Hutter)



Press Conference at JFK International Airport

In FY 2004, EML staff continued its support in the area of standards writing and protocol development. EML staff attended planning meetings for the development of a new series of ANSI standards and serve as members on writing groups in cooperation with NIST and the American National Standards Institute (ANSI).

- ANSI N42.37: “Training Homeland Security Responders in Use of Radiation Detection Instruments.”
This standard addresses training first responders on the use of instruments described in ANSI N42.32 to N42.35 for pagers, hand-held instruments, radionuclide identifiers, and portals, respectively.
(Peter Shebell, Paul Bailey)
- ANSI N42.38: “Performance Criteria for Spectroscopy-Based Portal Monitors Used for Homeland Security”
(Adam Hutter)
- ANSI N42.39: “Performance Criteria for Instruments Intended to Detect Neutron Radiation for Homeland Security Applications”
(Paul Goldhagen, Paul Bailey)

Standards Adoption

In the interest of application and promulgation of these standards:

- Technical assistance was provided to the Illinois Emergency Management Agency on the procurement of instruments compliant with ANSI N42.32 and ANSI N42.33 for Illinois first responders.
(Paul Bailey)
- The June 2004 topical meeting of the New York Area Science and Technology Workgroup provided an overview of the “Status of DHS S&T Standards Projects.” (See chapter above on Technical Assistance: Local Outreach.)
- An EML scientist gave an invited presentation entitled “Standards in DHS” at the 23rd Annual International Dosimetry and Records Symposium held in Big Sky, MT. The presentation covered an overview of S&T’s Standards Portfolio and highlighted accomplishments and ongoing projects in the standards arena.
(Matthew Monetti)

User Guidance Development

- EML’s Radiological Information Gateway is a Web site database application that focuses on first-responder equipment used to detect radiation. The site identifies equipment classifications and specifications as well as standards for the equipment, guidelines for selection of the equipment, and tests and evaluations conducted on the equipment. A similar database, the Responder Knowledge Base (RKB), jointly sponsored by the National Memorial Institute for the Prevention of Terrorism and the DHS Office for Domestic Preparedness, also contains equipment-related information for the emergency responder community. It was agreed that coordination and collaboration are needed to prevent duplication. EML has established an agreement with the RKB to provide expert answers to questions on radiation and radiation detection that are submitted to the RKB “Ask An Expert” feature. EML will also serve as reviewers/screeners for future information on radiation detection equipment that may be added to the Responder Knowledge Base.
(Richard Larsen)
- EML is developing a series of “easy-to-read” guides for purchasing radiation detection equipment to supplement and publicize the ANSI standards developed by DHS. The first in the series, “A First Responders Guide to Purchasing Personal Radiation Detectors (PRDs) for Homeland Security Purposes,” has been published. The guide, available at:

<http://www.eml.doe.gov/Standards/gateway/guide/gen/RadPagers.pdf>, is posted on EML's Radiological Information Gateway and on the RKB.

(Paul Bailey)

- Medical teletherapy units are in use in many hospitals and veterinary centers. These units contain high levels of ^{60}Co or ^{137}Cs . The consequences of the misuse of the active material in a radiological dispersal device were summarized in terms of the ranges of activities, chemical and physical form, weight of the radioisotope, exposure rates from unshielded units, and the whole body exposures at two distances from the source. The human metabolism and utilization of the element, excretion from humans, monitoring techniques, and typical detection limits to determine possible exposures were summarized. Also included was the potential for exposure, possible health effects, and lifetime cancer mortality rise coefficients.

(Isabel Fisenne)

ANSI Homeland Security Standards Database

EML continued to provide technical and project management assistance on the ANSI Homeland Security Standards Database. This database will provide users with a "search and retrieve" function of all published U.S. and international standards, as well as draft standards that are under development and that are available and related to homeland security. EML reviewed the database classification, database specifications, database metadata, and Standards Development Organization listings. Meetings were held to initiate the development and coordination of the taxonomy to be used in the database. It was agreed to start by focusing on standards for first responders using the nomenclature developed for the Standardized Equipment List, a publication of the InterAgency Board for Equipment Standardization and InterOperability. This will not only serve ANSI by providing a good trial dataset but will also benefit the Responder Knowledge Base and the InterAgency Board. A prototype of the DHS ANSI Standards Database is expected to be available for viewing in early FY 2005.

(Richard Larsen, Pamela Greenlaw)

Standards for Emergency Preparedness and Response (EP&R)

The EP&R Standards Program will identify gaps, needs, and corresponding tasks for standards development for radiation protection for the three identified emergency/consequence management phases: early (hours to days), intermediate (days to months), and late (months to years) responses. In addition to overall project management, EML is involved in liaisons with NIST, standards development organizations, and interagency groups to develop standards for first responders by addressing current needs and technologies for incident management.

ASTM Standards for EP&R

The initial phase of this project was begun in FY 2004 during which ASTM working groups were created. ASTM International Committee E54 on Homeland Security held a conference in Tampa, FL, in January 2004 at which the E54.02 subcommittee on emergency preparedness, training, and procedures drafted a scope of work followed by the establishment of working groups to address several tasks. EML staff are members and participate in writing group activities:

- ASTM E54.02.01: "Standard on Hospital Preparedness." The focus of this task group is on hospital preparedness. A draft of this standard was completed and balloted.

(Fabien Raccach)

-
- ASTM E54.02.02a: “Training for First Responders.” This standard is focused on instruments.
(*Peter Shebell*)

In addition to these newly formed writing groups, EML continued its activities in the development of the ASTM D19.04 standard on “Methods of Radiochemical Analysis.” EML participated at the Nuclear Incident Radiological Measurement Methods Meeting held in Las Vegas, NV, in April 2004, which provided a forum for discussing the need for new, improved, and rapid radioanalytical methods for the three phases of a radiological emergency event. At a meeting of Subcommittee ASTM D19.04 in June 2004 in Denver, CO, in collaboration with ASTM E54, in-depth discussions were held on the need for rapid methods appropriate to radiological emergency response activities, with a draft for a new radiostrontium (Sr-89 and Sr-90) technique introduced as a proposed standard.

(*Anna Berne*)

EML attended a meeting at the National Institute of Standards and Technology for discussion with the leadership of the American Standards Committee (ASC) N13 on their efforts in developing training standards for first responders. The ASC N13 concerns are focused on radiation protection of workers and the public related to the use, testing, and measurement of radiation.

(*Pamela Greenlaw, Peter Shebell, Paul Bailey*)

ANSI-Homeland Security Standards Panel (ANSI-HSSP)

EML participated in the ANSI-HSSP Workshop on Private Sector Emergency Preparedness and Business Continuity whose objective was to support the efforts of the National Commission on Terrorist Attacks Upon the United States (9-11 Commission), to identify existing standards and standards under development in the area of emergency management and business continuity, and to make recommendations for a high-level national standard for private sector emergency preparedness and business continuity. American National Standard, National Fire Protection Association (NFPA) 1600, “Standard on Disaster/Emergency Management and Business Continuity Programs,” served as the immediate, high-level baseline national standard from which all critical infrastructure areas could evolve. Subgroups worked on updating the Standard’s appendices, performing gap analysis, and updating terminology. In April 2004, ANSI presented the ANSI-HSSP Workshop’s recommendation to the 9-11 Commission.

(*Richard Larsen*)

Under the auspices of ANSI-HSSP, EML participated in a Workshop on Standardization for Training Programs for First Responders in WMD Events to develop a standards database to identify standards and conformity assessment activities and gaps related to homeland security training programs. A matrix of existing training standards is being developed that includes sections for 10 responder categories and will identify which tasks within the Office of Domestic Preparedness Universal Task List are addressed in each standard. In addition, applicable training programs and resources will be identified.

(*Matthew Monetti, Peter Shebell*)

Gamma Spectrometry Data Evaluation Program

The Gamma Spectrometry Data Evaluation Program assesses the capability of radiological laboratories to perform gamma-ray spectra analyses through the use of synthetic spectra. Radiological laboratories may not be familiar with the types of spectra to be expected after the detonation of a Radiological Dispersal Device (RDD) or the complex spectra resulting from the numerous short- and long-lived radionuclides to be

expected from detonation of a fission-type device. In FY 2004, synthetic gamma-ray spectra were prepared and sent out to approximately 90 U.S. and foreign laboratories. Participants have two months to complete their analyses and report their results to EML. The results of this year's evaluation are currently being compiled and evaluated, and an EML report discussing the results will be available on our Web site in the second quarter of 2005.

(Karin Decker)

Radiological Emergency Analytical Laboratory Network (REALnet)

In FY2004, work began on organizing a workshop to investigate the need for a national network of radiological analytical laboratories capable of responding to the radiological analytical needs required in the aftermath of a terrorist attack involving radiological materials. As part of this project, EML and the Council of Ionizing Radiation Measurements and Standards (CIRMS) organized a workshop, "REALnet—Radiological Emergency Analytical Laboratory Network," to be held at the 13th Annual Meeting of CIRMS in early FY 2005.

In May 2004, EML attended the 14th National Radiological Emergency Preparedness Conference held in Phoenix, AZ, which focused on radiological emergency preparedness and response, emergency management and radiological health. During the meeting, EML staff interacted with staff from FRMAC (*Federal Radiological Monitoring and Assessment Center*), FEMA (*Federal Emergency Management Agency*), NRC (*Nuclear Regulatory Commission*), and state radiological agencies to discuss the REALnet concept.

As a prelude to the workshop at CIRMS, EML initiated a working group of state radiation laboratory managers and representatives from EPA (*Environmental Protection Agency*), FRMAC, and the FDA (*Food and Drug Administration*) to survey the Performance Tests (PT) needed to assess the capability and capacity of radiation laboratories that may receive samples following a radiological emergency. A protocol for a study of laboratories' competence in quantifying selected gamma-emitting nuclides under conditions of quick turnaround time was prepared. The study will be conducted in FY 2005.

EML participated in an EPA initiative to identify the sampling and analysis components of federal and state environmental radiation-monitoring programs. A Web site (<http://www.eml.doe.gov/epamonprograms>) is being developed to promote the exchange, usability, and comparability of the monitoring data resulting from federal and state environmental radiation-monitoring programs. The EPA's Office of Radiation and Indoor Air (ORIA) sponsors this initiative. Information on federal and state environmental radiation monitoring programs, including program features and data quality objectives, are being collected, compiled, organized, and displayed through this Web site, which will also provide centralized links to the Web pages of the federal and state environmental radiation monitoring programs.

(Anna Berne, Richard Larsen)

Direct Support to DHS/Science and Technology (S&T) Standards Office

EML staff provides support to S&T HQ in fulfilling programmatic functions and responsibilities. This includes support to S&T HQ Standards Office as Deputy Director of the Standards Office. Responsibilities include program planning and execution; liaison with standards development organizations; and specific standards workgroups.

(Pamela Greenlaw)

EML staff accepted a detail to the National Incident Management Systems (NIMS) Integration Center (NIC) as the S&T Directorate representative to the Standards and Resources Branch. EML is working with DHS Standards Portfolio to develop and adopt standards to support NIMS implementation. The NIMS is a core set of doctrine, concepts, principles, terminology, and organizational processes to enable effective, efficient, and collaborative incident management at all levels. The NIC is responsible for the ongoing management and maintenance of the NIMS located in Washington, DC.

(Peter Shebell)

OTHER ACTIVITIES

DHS Visitors

During FY 2004, EML was pleased to host visitors from DHS HQ and from other DHS elements, some of whom presented seminars to the staff.



Dave Fluty, Director of Laboratories Scientific Services, Customs and Border Protection, “CBP Radiation Detection Program”



EML hosted the meeting of the Homeland Security Science and Technology Advisory Committee (HSSTAC), a statutory advisory committee that reports to Under Secretary for Science and Technology, Dr. Charles McQueary (seated, 3rd from left) (May 2004).

Other Seminars

William Lyerly, Director, Office of Weapons of Mass Destruction and Incident Management, “Overview of WMD, Office of Incident Management” (June 2004)

EML Participates at OPM “Working for America” Recruitment Fair

In April 2004, EML staffed a booth at the fair held at Madison Square Garden in New York City. This was one of many such recruitment fairs in a number of U.S. cities to connect participating federal agencies with high-quality diverse candidates.

(Saby Tavales, Anna Berne, Matthew Monetti)



EML at OPM Recruitment Fair

EML Participates in DHS Marketing Initiative Task Force

EML represented DHS/Science and Technology on the Steering Committee of the DHS Marketing Initiative Task Force whose goal is to develop a DHS Recruitment Brand.

(Sam Lee)

EML Participates in DHS Internship Program

The DHS Scholars and Fellows Program supports the development of the next generation of scientists.

EML sponsored two summer interns in FY 2004, both of whom gave an informal talk to the staff on their program. David Nerbun spoke on “Field Observation and Data Analysis of S&T Countermeasures Test Bed Sites,” and Diana David presented her talk on “Determining Channel Location of Peaks in Comprehensive Radiation Sensor Data.”



Laura Petonito (3rd from left); David Nerbun (4th from left)

Laura Petonito, Deputy Director of the DHS Office of University Programs visited EML to discuss EML’s participation in this program.

EML Participates in Meeting of Federal Laboratory Consortium (FLC) for Technology Transfer

The FLC for Technology Transfer is a nationwide network of federal laboratories that provides the forum to develop strategies and opportunities for linking technologies and expertise with academia, state and local governments, federal agencies, and the private sector. Representation on this consortium will promote the

DHS/S&T mission to develop and transition new technologies and homeland security capabilities to end users. EML's representative to the Federal Laboratory Consortium was invited to update the group on the role of Science and Technology in Homeland Security.

(Isabel Fisenne)

Reviews and Consultation

Assistance on RDD Cleanup Scenarios: In response to a request from the Fairfax County Virginia Hazardous Material Response Team, EML provided information regarding “dirty bomb” cleanup scenarios, including publications and references on roles and responsibilities and federal assets related to planning for RDD (*Radiological Dispersal Device*) response and DHS interagency work in progress on protective action guides.

(Gladys Klemic)

Samples Collected at North River Water Treatment Plant in New York City: In collaboration with researchers at the University of Massachusetts-Boston, EML collected water samples at the NYC Department of Environmental Protection's North River Water Treatment Plant in Manhattan for analyses of levels of radionuclides used in medical testing of natural and fallout radionuclides that are ubiquitous in the environment. This will help to define the “background” levels of artificial radionuclides present in the wastewater stream emanating from a large portion of Manhattan and may serve as a useful baseline for comparison in the event of an actual or suspected radiological event.

(John Kada)

Review of US EPA Companion CBR Methods Advisor: EML completed a review of the structure and usability of a US EPA Companion CBR Methods Advisor to the National Environmental Methods Index-Chemical-Biological-Radiological (NEMI-CBR) database. NEMI-CBR contains methods that may be applied to identifying chemical, biological, and radiological contaminants emanating from a terrorist attack on water supplies.

(Raymond Lagomarsino)

Meetings Organized and Sessions Chaired

Carl Gogolak

Organize special session on the MARLAP (*Multi-Agency Radiological Laboratory Analytical Protocols*) Manual—Health Physics Society Annual Meeting, Washington, DC (July 11, 2004)

Kevin Miller

Chair and Organizer, Third Topical Meeting, New York Area Science and Technology (NYAST) Workgroup on Radiological Dispersal Devices, EML (March 19, 2004)

Chair and Organizer, Fourth Topical Meeting, New York Area Science and Technology (NYAST) Workgroup on Status of Department of Homeland Security Standards Projects, EML (June 22, 2004)

Rita Rosen

Co-Organizer, Third Topical Meeting, New York Area Science and Technology (NYAST) Workgroup on Radiological Dispersal Devices, EML (March 19, 2004)

Co-Organizer, Fourth Topical Meeting, New York Area Science and Technology (NYAST) Workgroup on Status of Department of Homeland Security Standards Projects, EML (June 22, 2004)

Colin Sanderson

Chair, Session on “Network Quality Control, Laboratory Certification Document,” at 2004 International Monitoring System Radionuclide Laboratories and Noble Gas Workshops, Strassoldo, Italy (August 22–27, 2004)

Technical Seminars by Visiting Scientists

The seminar program at EML by visiting scientists keeps the scientific staff informed on programs and research in other institutions

Major H.J. Hietala, Commander, New York National Guard 2nd Weapons of Mass Destruction—Civil Support Team, “2nd CST Capabilities Briefing” (October 22, 2003)

Eric Hansen, Jim Silverstrim, Eric Holland, Innovative Wireless Technologies, “Emerging Wireless Technologies for a National Sensor Network” (November 21, 2003)

Claude Degueldre, Paul Scherrer Institute, Villigen, Switzerland, “Work in Progress at PSI” (November 21, 2003)

Kenneth Morrelly, Long Island Forum for Technology, “CBRN Networks” (February 26, 2004)

Paul J. Kolodzy, Stevens Institute of Technology, “Heterogeneous Mobile Networking” (April 30, 2004)

Ari Kaufman, State University of New York at Stony Brook, “Plume Modeling and Visualization for Urban Security” (June 10, 2004)

Samir Das, State University of New York at Stony Brook, “Wireless Research at Stony Brook University” (June 10, 2004)

Presentations at NYAST Workgroup Topical Meetings

3rd Topical Meeting—Radiological Dispersal Devices—March 18, 2004

Leonard W. Connell, Sandia National Laboratory, “Dirty Bombs (RDD): A Risk-Based Systems Analysis”

Lawrence C. Trost, Sandia National Laboratory, “RDD Consequence Management: Medical Management/Cleanup”

Frederick T. Harper, Sandia National Laboratory, “Quick Summary of Acute Health Effects from Radiological Dispersal Devices”

Michael Corr, Northeast Operations, Bechtel Nevada, Counter Terrorism Operations Support, “WMD Radiological/Nuclear Training Programs—Department of Homeland Security, Office for Domestic Preparedness”

4th Topical Meeting—Status of Department of Homeland Security Standards Projects—June 22, 2004

Peter Shebell, EML, “Overview of DHS Efforts in Standards”

Brad Mason, Federal Emergency Management Agency (FEMA), “National Incident Management System (NIMS)”

Michael Unterweger, National Institute of Standards and Technology, “Update on ANSI N42 Standards on Radiation Detection Instrumentation”

Charles Brannon, National Institute of Standards and Technology, “Development of New Standards from the ASTM and E54 Committee”

Presentations at Scientific Meetings

Isabel M. Fisenne

“Transition of EML from DOE to DHS,” Federal Laboratory Consortium for Technology Transfer Joint Northeast/Midwest Regional Meeting, New York, NY (October 2003)

Anna Berne

“EML’s Quality Assessment Program in 2004: New Name and New Goals?”, 49th Annual Radiobioassay and Radiochemical Measurements Conference, Jackson, WY (October 2003)

Carl Gogolak

“Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Supplements: Overview/Development Update,” NRC Annual Nuclear Safety Research Conference, Washington, DC (October 2003)

Richard Larsen

“Radiation Event Manager,” ESRI Federal User Conference, Washington, DC (January 22, 2004)

Colin Sanderson

“The EML Surface Air Sampling Program,” 37th Midyear Meeting of the Health Physics Society, Augusta, GA (February 8, 2004)

Fabien Raccach

Invited: “Experiences as an Observer for DHS during Operation Winter Sun and Operation United Response,” American Industrial Hygiene Association Conference, New York, NY (March 17, 2004)

Carl Gogolak

Invited: “The Incorporation of Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Techniques into SADA,” NRC Public Workshop, Rockville, MD (May 3, 2004)

Carl Gogolak

Invited: “The Evolution of SADA, Using Bayesian Geostatistical Approaches to Surficial and Volumetric Contamination Characterization and Analysis,” NRC Public Workshop, Rockville, Maryland (May 3, 2004)

Kevin Miller

Invited: “Environmental Monitoring for Radiological Incidents,” Spring Annual Symposium of the Greater New York Chapter, Health Physics Society, New York, NY (May 4, 2004)

Carl Gogolak

Invited: “MARSSIM and MARLAP Statistics,” NNSA Consequence Management Emergency Sampling and Design Working Group, Las Vegas, NV (May 12, 2004)

Mitchell Erickson

“Environmental Monitoring and Measurement Issues for Homeland Security,” EnviroAnalysis, 5th Biennial Conference on Monitoring and Measuring of the Environment, Toronto, Canada (May 16, 2004)

Matthew Monetti

Invited: “Standards in DHS,” 23rd Annual International Dosimetry and Records Symposium, Big Sky, MT (June 6, 2004)

Peter Shebell

“Overview of DHS Efforts in Standards,” New York Area Science & Technology Workgroup 4th Topical Meeting, New York, NY (June 22, 2004)

Gladys Klemic

Invited: “External Dosimetry in the Aftermath of a Radiological Terrorist Event,” 14th International Conference on Solid State Dosimetry, New Haven, CT (July 1, 2004)

Paul Bailey

“Neutron Detection Using NaI Scintillators,” 49th Annual Meeting of the Health Physics Society, Washington, DC (July 14, 2004)

Carl Gogolak

“DQOs, MQOs, LLDs, MDCs, MQCs and All Those TLAs (Three Letter Acronyms),” 49th Annual Meeting of the Health Physics Society, Washington, DC (July 13, 2004)

Paul Goldhagen

“Calculations and Measurements of the Cosmic-Ray Neutron Spectrum on a High-Altitude Airplane,” IEEE Nuclear and Space Radiation Effects Conference, Atlanta, GA (July 19, 2004)

Paul Goldhagen

“Measurements of the Flux and Energy Spectrum of Cosmic-Ray Neutrons on the Ground at Various Locations,” IEEE Nuclear and Space Radiation Effects Conference, Atlanta, GA (July 19, 2004)

Mitchell D. Erickson

Invited: “The Role of Science and Technology in Homeland Security,” Workshop on Urban Air Transport Modeling and Its Standard, Research Triangle Park, NC (September 16, 2004)

Peter Shebell

Invited: “Overview of Standards and the Department of Homeland Security,” Workshop on Urban Air Transport Modeling and Its Standard, Research Triangle Park, NC (September 16, 2004)

Hsi-Na (Sam) Lee

Invited: “New Thoughts for Urban Transport Modeling,” Workshop on Urban Air Transport Modeling and Its Standard, Research Triangle Park, NC (September 16, 2004)

Hsi-Na (Sam) Lee

“Overview of Working Group 5 on Urban Air Transport Modeling and Its Standard,” Office of the Federal Coordinator for Meteorology, Rockville, MD (September 22, 2004)

Topical Talks at EML

Presentations at EML by EML staff keep the managers and scientific staff informed of progress in programs in the Laboratory as well as activities in related areas

Anna Berne, “QAP Questionnaire” (October 2, 2003)

Anna Berne, “QAP Update” (October 30, 2003)

Richard Larsen, “Installation of CRS at Lehman Brothers” (November 6, 2003)
Cecilia Breheny, “Comprehensive Radiation Sensor for Maritime Use” (December 18, 2003)
Brian Albert, “Comprehensive Radiation Sensor for Maritime Use” (December 18, 2003)
Adam Hutter, “PANYNJ Radiation Test Bed: New Year’s 2004 Emergency Operations” (January 27, 2004)
Peter Shebell, “Standards for First Responders” (February 23, 2004)
Colin Sanderson, “UD-04 Exercise” (May 5, 2004)
Kevin Miller, “SMART-RAD: A Plan for Monitoring Following Radiological Incidents in the NY/NJ Area”
(June 16, 2004)
Paul Bailey, “Dosimetry in the Aftermath of a Radiological Terrorist Event” (July 7, 2004)

Committee and Outside Coordination Activities—National and International

(not included in main text)

Alfred Crescenzi

Member, DHS Safety and Health Council
Member, DHS National Environmental Policy Act (NEPA) Workgroup
Member, DHS Environmental Planning Council

Isabel Fisenne

Member, Scientific Advisory Committee, U.S. Transuranium and Uranium Registries
Member, Editorial Advisory Board, Textbook on Radioanalytical Chemistry

Carl Gogolak

Co-Chair, Radiation Protection Scientific Subcommittee, Council on Ionizing Radiation
Measurements and Standards (CIRMS)

EML Scientist Named as Secretariat of WMO/GAW: Hsi-Na (Sam) Lee has been named as Secretariat of the World Data Centre for Greenhouse Gases and the World Meteorological Organization’s Global Atmosphere Watch (WMO/GAW). The GAW is a coordinated network of meteorological stations and related facilities whose purpose and long-term goal is to provide data, scientific assessments, and other information on changes in the chemical composition and related physical characteristics of the atmosphere from all parts of the globe.

EML PUBLICATIONS

10/01/2003 TO 9/30/04

The journal *Health Physics* featured an article by an EML scientist on the results of an *in-situ* gamma-ray spectrometry intercomparison held in Grand Junction, CO (see listing below). This intercomparison was a collaborative effort between EML and the US EPA's Office of Radiation and Indoor Air. A photograph of the tripod-mounted HPGe detector (high-purity germanium detector) appeared on the cover.

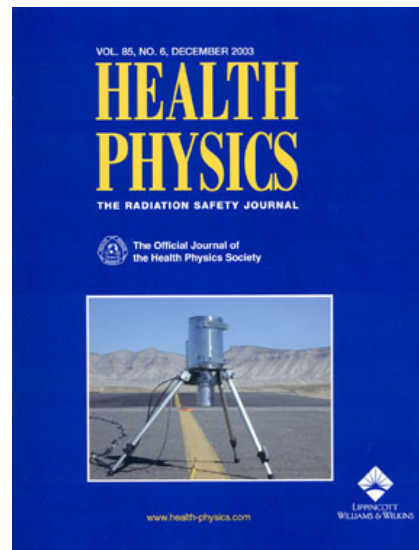
Bailey, P. "A First Responders Guide to Purchasing Radiation Pagers for Homeland Security Purposes." USDHS Report EML-624, August 2004.

Cahill, T.A., S.S. Cliff, K.D. Perry, M. Jimenez-Cruz, G. Bench, P. Grant, D. Ueda, J.F. Shackelford, M. Dunlap, M. Meier, P.B. Kelly, S. Riddle, J. Selco, and R. Leifer. "Analysis of Aerosols from the World Trade Center Collapse Site, New York, October 2 to October 30, 2001." *Aerosol Science and Technology* 38 (August 2004): 165-183.

Elcock, D., G. Klemic, and A. Taboas. "Establishing Remediation Levels in Response to a Radiological Dispersal Event (or 'Dirty Bomb')." *Environmental Science and Technology* 38, 9 (March 2004): 2505-2512

Golhagen, P.E., and J.M. Clem. "Measurements of Cosmic-Ray Neutron Spectra in the Stratosphere: A Benchmark for Calculations of Cosmogenic Nuclide Production." 1st International Expert Meeting/Workshop on Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies, WMO/GAW Report 155, 2004, Vol. WMO TD No. (January 2004)

Shebell, P. "An In-Situ Gamma-Ray Spectrometry Intercomparison." *Health Physics* 85, 6 (December 2003): 662-677





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